

CD 22
CD 24
Caelus disk cartridge drives

Caelus Disk Cartridge Drive

Key Features

High reliability through mechanical simplicity

Electro-optical head positioning

Discriminated output

Ramp head loading

Performance

11, 22, or 44 Megabits capacity

70 ms average access time

Up to 1.55 MHz data transfer rate

1025 or 2200 BPI packing density



Low-Cost On-Line Storage for Mini-Computer Systems

Caelus Memories is a recognized leader in the production of high quality disk packs and disk cartridges. The development of the Caelus Disk Cartridge Drive has evolved logically from the need to develop special test equipment for the production of disk packs. Caelus Disk Cartridge Drives are general purpose on-line digital storage files designed specifically for high performance and unsurpassed reliability, virtually eliminating maintenance and field adjustments. The removable disk feature provides unlimited off-line storage.

There are four optional disk drive configurations to fit your needs. The CD11 is a single low density drive and one power supply. The CDD22 is a dual configuration—two low density drives, one power supply. The CD22 is one high density drive and one power supply. The CDD44 is the high density dual configuration with a single power supply.

A one-disk system may be expanded to a two-disk system simply by adding the second drive; no additional electronics or power supply are required.

Reliability

Detailed engineering studies have been conducted to make Caelus Disk

Drives as reliable as possible. The drives feature the first electro-optical head-positioning servo system, discriminated output usually found only in separate controllers, a discrete binary address register, and design simplicity which eliminates over 40% of the mechanical parts found in other drives. The electronics are packaged on a minimum of cards to reduce connector problems. Integrated circuits are used wherever possible to increase reliability. Design parameters include an overall M.T.B.F. of at least ~~1,000~~ ²⁵⁰⁰ hours and mean time to repair of less than 30 minutes.

The drives have been repeatedly tested to the environmental and line voltage specifications listed in this brochure. Component life testing shows a life excess of 100,000 hours. In addition, Caelus Disk Drives have been tested and approved by Underwriter Laboratories.

The Caelus Disk Drive is ideally suited for third and fourth generation mini-computer systems which demand reliable peripherals that may be maintained by less experienced service personnel. Simplicity in design, absolute minimum of mechanical motion, and elimination of electronic and mechanical adjustments are the reliability basis of the Caelus Disk Drives.

Complete Product Control

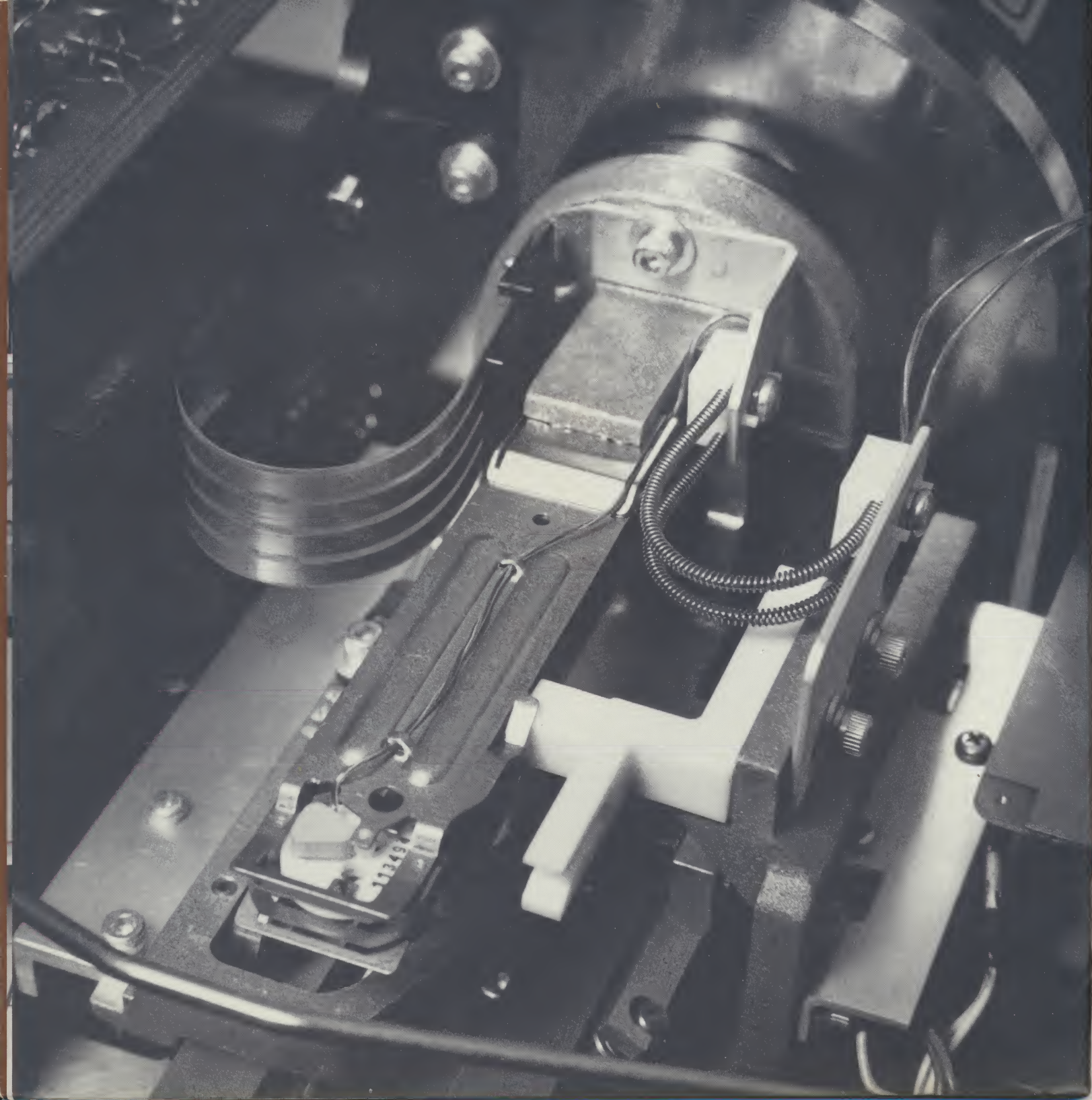
The successful incorporation of magnetic media with electromechanical disk files necessitates absolute control over the coating and finishing of the oxide disk, the design and manufacturing of flying head assemblies, mechanical components, and the incorporation of third and fourth generation electronics.

Disk Cartridges

The Caelus Disk Drives use magnetic oxide coated disks as the recording media. The Caelus CD11 and CDD22 Disk Drives use the CM-1-LD Disk Cartridge that has a storage capacity compatible with the IBM 2315. The Caelus CD22 and CDD44 use the CM-1-HD which has twice the capacity of the CM-1-LD. Both types of disk cartridges are manufactured by Caelus to provide the highest quality, error-free products through complete process control.

Preventive Maintenance

When Caelus Disk Drives are operated in a normal data-processing environment, recommended preventive maintenance is only 30 minutes per month. Caelus will quote other preventive maintenance schedules for unusual environments.



Head Positioning

The head positioning mechanism in the Caelus Disk Drive consists of a linear motor (voice coil) and a carriage/rail system. The carriage travels on ball bearings, spring-loaded to the rails. Borrowing a technology from the machine tool control industry where accuracies of ten microinches are routinely achieved, Caelus Disk Drives employ an electro-optical head positioning servo system which assures reliable, repeatable and precise head positioning. Two control loops are used to position the heads. The coarse loop compares a voltage derived from the desired address to the voltage of a linear position transducer mounted on the head-carriage/rail system. The compared differential is

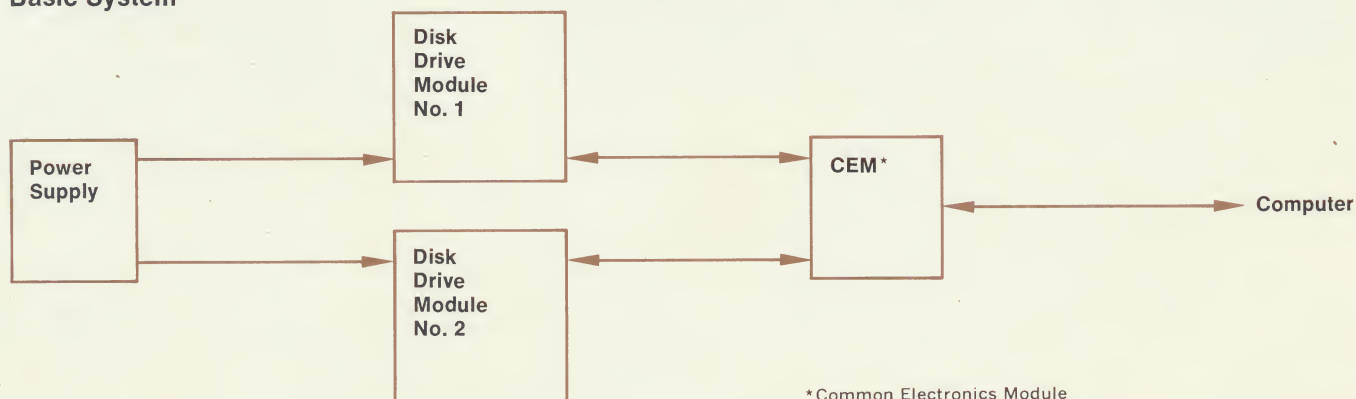
amplified to drive the linear motor. When the heads are within two tracks of the final position, the fine position loop takes control. The fine position control loop employs an electro-optical sensor which comprises two optical grids, a light source and photoelectric sensors. One grid is mounted on the base casting and the other is mounted on the carriage. The linear motor positions the carriage until the output of a selected photocell is at a null. Any external force which attempts to shift the position of the heads will be countered by an opposite force generated by the servo control system. There is no potential of mechanical wear or failure. The linear

motor is always energized, head positioning is always active.

Ramp Loading

In contrast to complicated loading schemes of some drives, the heads of Caelus Disk Drives are positioned to the correct flying height by a simple ramp load technique. This minimizes head crashes because no vertical operational adjustment occurs after the head is positioned over the disk. The Caelus head altitude control system uses a ramp to lift the heads when they are disengaged from the disk; during track positioning, leaf spring arms provide the vertical force offsetting the aerodynamic head lifting force. No torsion bars or cams are used.

Basic System





DTU Drive Test Unit

As support equipment for the new series of disk drives, Caelus has also announced the availability of its DTU (Disk Test Unit). The DTU simulates all the functions of a computer in controlling the disk drive, and eliminates the need for the use of a computer when performing disk-drive preventive or corrective maintenance.

The DTU's data controls permit verification of a disk file's read/write capability. Depending on the position of the data switches, the drive may be instructed to write only, read only, or alternately write/read on one head only, or alternately on both heads. The DTU operator may also select a data pattern consisting of all 1's or all 0's or alternate 1's and 0's. In the read-only mode, the disk file data is compared with the data pattern specified by the data switch. Should a data error occur, an error light goes on and track sequencing comes to an unconditional halt.

Output terminals are provided for the display of all control and synchronization signals, and data output, on an oscilloscope.

The DTU is very compact, portable, and packaged within a standard attache case.

Data Safety

Every precaution has been taken to insure data integrity. The disk cartridge must be properly seated before the Spindle ON/OFF switch will apply power to the drive mechanism. When the disk has reached a predetermined speed, the linear positioning motor moves the heads to track "000," and a File Operational signal is transmitted to the controller—indicating that the drive will accept an address. To prevent the inadvertent destruction of recorded data, the Write Amplifier is inhibited when disk speed is below a specific level or when system DC voltage falls below a predetermined level.

In the event of a loss of spindle rotational speed, an AC power failure, or when the Spindle ON/OFF switch is deactivated, the linear positioning motor is automatically driven to the "home" position. The heads are thereby retracted from the disk, preventing a potential crash. This automatic feature is accomplished by switching the power source of the linear motor to a nickel-cadmium battery (constantly on recharge when the drive is "on").

Data Reliability

Caelus' use of double frequency encoding provides an extra margin of data reliability. Since the clock is recorded along with the data, its presence in the read signal is used to compensate for any bit shift normally encountered in higher density magnetic recording or from minor variations in disk rotational speed. The read clock is used to drive a phase-locked oscillator developing a precise clock frequency. By synchronizing the data with the corrected clock, a precisely timed data output is provided.

System Specifications

I/O Interface:

The I/O interface for data and control signals is an open-collector circuit with resistive termination at the receiving end. The external I/O cable is terminated in a Cannon DDC-50 connector. The terminations are single-ended and permit operation at distances up to 25 feet. A detailed Installation Reference Guide is available upon request.

Storage Capacity:

22 Megabits per disk, formatted in 24 sectors with 200 tracks per surface (plus 3 spares).

Bit Density:

2200 BPI inside track (max), or 1025 BPI inside track, or configured to system requirements.

Track Density:

100 TPI

Recording Medium:

CM-1-LD and CM-1-HD
Disk Cartridges

Recording Band:

2 inches (5.08 cm).

Disk Diameter:

14 inches (33.56 cm).

Cartridge Diameter:

15 inches (36.1 cm).

Coding:

Double frequency.

Transfer Rate:

1.55 MHz (2200 BPI) max.
720 kHz (1025 BPI)

Head Configuration:

Air-bearing head with magnetic elements supported in ceramic pad. (2200 BPI)

Access Time:

(times include head settling)

Track-to-track: 35 ms ¹⁴

Average random: 70 ms ⁶⁰

Maximum access: 100 ms ⁸⁵

Average latency: 20 ms

Disk Rotation Speed:

1500 rpm.

Operating Environment:

Temperature: 50 to 100°F.

Relative humidity: 10 to 80%.

Cooling: Forced room air.

Air Filter:

A 40-micron air filter which has proved adequate for long head life in normal data processing environments. For operation in extremely dirty environments Caelus offers optional 0.3-micron air filter.

Power:

115VAC $\pm 10\%$, 60 Hz $\pm 1\%$, 5A or
200-250 VAC, 50 Hz $\pm 1\%$, 3A.

Mounting:

The system will mount in a standard 19-inch rack or a Caelus furnished cabinet.

Packaging

Caelus Disk Drives can be mounted in our cabinet or mounted in a 19-inch relay rack. Compactness of mechanical design allows the drive to be enclosed in 12.25 inches vertical height in a 19-inch wide by 30-inch deep standard EIA rack. This compactness eliminates need for special cabinets.

Power Supply Module

Width: 19 inches

Depth: 15 inches

Height: 8.75 inches

Common Electronics Module

The Common Electronics Module is mounted within the Power Supply Module.

Caelus Cabinet Features:

Height: 54 inches

Width: 22 inches

Depth: 30 inches

The upper drive is rigidly mounted to the frame. The lower drive is mounted on slides that roll out to the rear for maintenance. All panels "snap off" to allow easy access to all components.



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